PATENT SPECIFICATION

DRAWINGS ATTACHED

1,145,325

1,145,325

Date of Application and filing Complete Specification: 21 Sept., 1966.
No. 42182/66.
Application made in United States of America (No. 501,768) on 22 Oct., 1965.
Complete Specification Published: 12 March, 1969.

Index at acceptance:—E2 S(1A2B4, 1A3B, 3C); **B5 A**(1G5A, 1G7C, 1G10, 2A3, 7B)
Int. Cl.:—A 44 b 19/14

COMPLETE SPECIFICATION

Improvements relating to Fasteners

We, FLEXIGRIP LIMITED, a British Company of 46, Kingsway, London, W.C.2, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

Containers used for storing materials which are subject to corrosion or which are highly effervescent must be hermetically sealed. This is also the case with containers used for storing materials which deteriorate on exposure to air. Accordingly a fastener for such a container must provide a hermetic seal as well as having a secure fastening action. If the container is flexible, the fastener itself should be flexible.

According to the present invention a flexible fastener particularly suited for use with such containers comprises a pair of flexible thermoplastics elements, one of which carries a more resilient thermoplastics substance, formed respectively with a rib having an enlarged head which has an undercut surface, and a cooperating groove having a restricted opening which also has an undercut surface. The arrangement is such that as the fastener is closed the rib is forced through the restricted opening into the groove, the undercut surfaces move into engagement with one another to tend to resist subsequent separation, and the more resilient substance is compressed between the elements and ensures that the fastener provides a hermetic seal. Such a fastener can be manufactured easily and cheaply by an extrusion process. In contrast to conventional thermoplastic fasteners, however, which are also usually manufactured by extrusion, it provides a secure fastening action together with a hermetic seal. The undercut surfaces provide the former action while the resilient material provides the seal. In this context, it is important to note that the elements must be sufficiently resilient to enable one or both to be deformed during the fastening and separating actions yet conversely they must be sufficiently rigid to provide a secure fastening action. The more resilient substance on the other hand must be sufficiently resilient to ensure that it fills any spaces which would otherwise occur between the two elements when fastened together. From this it can be seen that the more rigid substance on which the fastening action relies can be replaced by the more resilient substance only in certain parts of the fastener.

By way of example, fasteners in accordance with the invention and their method of manufacture will now be described with reference to the accompanying drawings in which:—

Figures 1 to 5 are cross-sections through such fasteners;

Figure 6 is a sectional view through an extruder for the manufacture of the fasteners illustrated in Figures 1 to 5, in particular those of Figures 3 and 4;

Figure 7 is a sectional view taken along the lines VII—VII of Figure 6;

Figure 8 is a partially sectioned perspective view of manufacture of the fastener of Figure 5;

Figure 9 is an end perspective view of manufacture of the fasteners of Figures 1 and 2;

Figure 10 is a sectional view through one part of another such fastener; and

Figure 11 is a cross-section through the fastener part of which is shown in Figure 10.

Each of the fasteners illustrated in the accompanying drawings is manufactured from two thermoplastics substances having different physical characteristics. The substance constituting the greater part of each fastener, while being flexible, is sufficiently rigid to ensure that the fastener has a secure fastening action. The other substance is considerably more resilient and provides the hermetic seal between the two parts of the fastener.

Reference should first be made to the fastener shown in Figure 1. This comprises two flexible closure strips 10 and 11 respectively joined by narrower portions 16 and 17 to re-

spective web portions 12 and 13. The latter may be integral with or heat-sealed to the sides or walls of a pouch or other container. The closure strips 10 and 11 have ribs and grooves which engage with one another. Thus the strip 10 has ribs 18 and 19 which engage with grooves 20 and 21 respectively in the strip 11. The latter strip has ribs 22 and 23 which engage with grooves 24 and 25 respectively in the strip 10. Since all the ribs are similar to one another, only the rib 23 will be described. This has a shank 26 and an enlarged head 27, the outer surface of which is convex in cross-section. The head 27 also has an overhanging ridge providing an undercut engaging surface 29. Adjacent the rib 23 is the groove 21. This has a restricted opening 30 and an enlarged inner cavity 31. It also has an undercut engaging surface which is indicated by the reference numeral 29 since this surface is common to the groove 21 and the rib 23.

As previously mentioned, the fastener is manufactured from two thermoplastics substances having different physical characteristics. The parts already described are all manufactured from the more rigid substance. The more resilient substance is located in the form of layers 33 at the base of the grooves. As will be explained later, it is integral with the more rigid substance.

Closure of the fastener is accomplished by applying pressure to the outer surfaces of the closure strips 10 and 11. This has the effect of deforming the overhanging ridges which in consequence pass through the respective restricted openings into the grooves. The overhanging ridges then assume a substantially unstressed condition in which the ribs and grooves engage one another along the undercut engaging surfaces. These surfaces accordingly resist subsequent separation of the strips 10 and 11, acting as a mechanical interlock. Separation, however, may be achieved either by means of a slider (not shown) having a wedge inserted between the strips, which are then peeled apart as the wedge is drawn between them, or by lifting the web portion 13 to pull the ribs and grooves apart.

As the ribs enter their respective grooves, the layers 33 of the more resilient material are compressed. When the overhanging ridges assume the substantially unstressed position and the pressure on the closure strips 10 and 11 is removed, the layers 33 relax slightly. However they are still maintained under compression. In consequence a hermetic seal is produced between the two closure strips 10 and 11. Due to the resilient nature of the material of the layers 33, it conforms to any minor surface irregularities in the convex heads of the ribs. In some cases, a tighter seal may be required in which case the heads of the ribs may be made a little larger than the grooves.

The fastener shown in Figure 2 is similar to that of Figure 1 but has a different sealing arrangement between the two parts of the fastener. In particular, both the rib 18 and the adjacent groove 25 of the closure strip 14 carry a layer 35 of the more resilient substance providing a surface 34. Similarly, a layer of the same substance is carried by the rib 23 and by the adjacent groove 20 of the closure strip 15. Accordingly when the fastener is closed, as illustrated, a hermetic seal is provided over a relatively large area. As in the previous example, the undercut engaging surfaces 29 are formed of the more rigid substance to ensure a secure fastening action.

In the fastener shown in Figure 3, an entire rib 36 is formed of the more resilient substance. The rib 36 is integral with the closure strip 37 and has oppositely disposed overhanging ridges 38 and 39 providing undercut engaging surfaces which cooperate with like engaging surfaces of adjacent ribs, i.e. of adjacent grooves, of the closure strip 42. By providing an additional undercut engaging surface formed of the more resilient substance, important advantages result. In particular, forces applied to the closure strip and so directed as to open the fastener cause compression of all of the undercut engaging surfaces. In consequence the hermetic seal is maintained when the fastener is stressed. Again, to ensure a tighter seal, the rib made of the more resilient substance may be made slightly larger than its cooperating groove.

The fastener shown in Figure 4 is similar to that of Figure 3 having a rib 45 of the more resilient substance. The cooperating groove 46 has a layer 47 of the more resilient substance formed on it. By providing this substance on both the rib and the groove, any irregularities necessarily associated with the extruding of thermoplastics elements are even less likely to affect the quality of the seal.

The fastener shown in Figure 5 has closure strips 48 and 49. The closure strip 48 has bifurcated leg members 50 and 51 having integral rounded heads 52 and 53 respectively. As in the previous examples, the heads 52 and 53 have overhanging ridges 54 and 55 providing undercut engaging surfaces. A groove extends between the bifurcated leg members having a highly restricted groove opening 58 and an enlarged inner cavity 59. The closure strip 49 has cup-shaped wall portions 60 and 61 abruptly terminating in flat edges 62 and 63. The wall portions 60 and 61 have inner grooves 64 and 65 formed adjacent to the abrupt ends 62 and 63 for receiving the heads 52 and 53 of the closure strip 48. The grooves 64 and 65 define a rib having a shank 66 and a head 67. As in the previous example, the head 67 has overhanging ridges 68 and 69 providing undercut engaging surfaces which cooperate with the like surfaces of the bifurcated leg members 50 and 51. The head 67 also has a rounded surface 72 which cooperates with the walls of the inner cavity 59.

Grooves 73 and 74 are formed at the crest and base respectively of the head 67 and the groove formed between the leg members 50 and 51. These grooves 73 and 74 have restricted necks 75 and enlarged inner cavities 76. Each of the grooves is filled with a bead of the more resilient substance. The result is that a hermetic seal is provided along a surface 77 between the respective layers of the more resilient material.

Figures 10 and 11 show a fastener having an interengaging structure similar to that of Figure 1 but having strips 135 of the more resilient substance formed on the ribs 18 and 19. The strips 135 are compressed within the grooves as shown in Figure 11 thus forming the hermetic seal.

Figure 6 shows an extruder which is particularly suited for producing the closure strips shown in Figures 3 and 4. It has a body 80 containing a main channel 81 having a straight-through passageway 82 and tapered walls 83 leading to a port 84 formed within a die head 85. The latter is secured to the extruder body 80 by bolts 86. The port 84 acts as a die and creates the desired shaping of the closure strips, as shown in Figure 7. The port 84 provides three ribs 87, 88 and 89 formed in a closure strip 90 and connected to a web portion 91 similar to the constructions of Figures 3 and 4. The main channel 81 houses a worm drive 92 which urges a stream of the heated more rigid thermoplastics substance 93 along the channel to the die 84. In addition to the main channel 81, the extruder includes a second channel 94 substantially perpendicular to the main channel and having walls 95 secured rigidly to the extruder body 80 at 96. The channel 94 also houses a worm drive 97 which may be operated independently of the worm drive 92. The drive urges a heated stream of the more resilient thermoplastics substance 98 along the channel 94. The substance is subsequently injected into the main stream in the main channel 81 through a tube 99 which extends through an opening 100 within the extruder body. A threaded plug 101 enables the position of the tube 99 to be adjusted within the main channel 81. The tube 99 has a curved neck 102 and an outlet 103. Thus the more resilient substance issuing from the outlet 103 has a direction of flow which is the same as that of the main stream.

By correct location of the tube 99, adjustment of the speed of the worm drive 97, and orientation of the die head 85, the more resilient thermoplastics substance can be caused to cover a highly specific area on the thermoplastics strip. A major advantage of this extruder is that the two thermoplastics substances contact one another while in a fluid state with the result that a strong integral junction forms between them upon cooling.

Figure 8 shows how the fastener of Figure 5 can be manufactured. The closure strips are formed in an extruder and are then allowed to cool. The more resilient thermoplastics substance is then poured in a fluid state into grooves where it forms the beads. In making such a strip, the strip, shown as 49, is moved longitudinally as indicated by the arrow 104. The heated, more resilient, thermoplastics substance 107 flows along a tube 105 to a tongue-like portion 106 where it is fed directly into the cavity 76 of the groove 74. A plate 108 moulds the surface of the substance so as to give it a substantially smooth surface. Air is introduced for cooling purposes through a sleeve 109 attached to the plate 108. An identical process may be employed for filling the cavity formed between the bifurcated leg members of the closure strip 48.

Manufacture of fasteners similar to those of Figures 1 and 2 is shown in Figure 9. The more resilient thermoplastics substance in a heated fluid state is sprayed on to highly localised regions of the thermoplastics strip. These regions correspond to areas of surface deficiencies such as those indicated at 114 and 115, on the closure strips, which have previously been extruded in this way. Once the closure strip has been formed and cooled, a series of spray nozzles 118 — 121 are used to direct concentrated streams 122 — 125 of the more resilient substance on to the regions of the closure strip which have a surface deficiency during which the strip is moved longitudinally as indicated by the arrow 126.

By correct orientation of the spray nozzles, by providing the correct surface deficiency in the mouldings of the closure strip, by providing correct longitudinal movement of the closure strip, and by adjusting the flow rate through the spray nozzles, a build-up of the more resilient substance can be caused at the regions 127—130 and will eliminate the surface deficiencies and provide the necessary sealing surfaces.

WHAT WE CLAIM IS:—

1. A flexible fastener comprising a pair of flexible thermoplastics elements, one of which carries a more resilient thermoplastics substance, formed respectively with a rib having an enlarged head which has an undercut surface, and a cooperating groove having a restricted opening which also has an undercut surface, the arrangement being such that as the fastener is closed the rib is forced through the restricted opening into the groove, the undercut surfaces move into engagement with one another to tend to resist subsequent separation, and the more resilient substance is compressed between the elements and ensures that the fastener provides a hermetic seal.

2. A flexible fastener according to claim 1 in which the outer surface of the rib is convex in cross-section.

3. A flexible fastener according to claim 1 or 2 in which undercut surfaces extend along

both sides of the head and along both sides of the opening.

4. A flexible fastener according to any one of the preceding claims in which the element formed with the rib is also formed with a groove adjacent to the rib and having a restricted opening which has an undercut surface, and in which the element formed with the groove is also formed with a rib adjacent to the groove and having an enlarged head which also has an undercut surface, the arrangement being such that as the fastener is closed both ribs are forced through the respective restricted openings into the respective grooves and the undercut surfaces of both heads and openings move into engagement with one another to tend to resist subsequent separation.

5. A flexible fastener according to any one of the preceding claims in which the more resilient substance is integral with the element carrying it.

6. A flexible fastener according to any one of the preceding claims in which the more resilient substance extends along the base of the groove or grooves.

7. A flexible fastener according to any one of claims 1 to 5 in which the more resilient substance is in the form of a bead extending along the outer edge of the rib or ribs or along the base of the groove or grooves.

8. A flexible fastener according to claims 4, 5 and 6 in which the more resilient substance extends in each element from the base of the groove to the outer edge of the adjacent rib.

9. A flexible fastener according to claims 4 and 5 in which the more resilient substance constitutes one of the ribs.

10. A flexible fastener substantially as described with reference to and as illustrated in any of Figures 1, 2, 3, 4, 5, and 10 and 11 of the accompanying drawings.

11. A method of making the flexible thermoplastics element carrying the more resilient thermoplastics substance, of the flexible fastener according to any one of claims 1 to 4, in which a heated thermoplastics substance is extruded through a die producing the element together with either the rib or the groove or both, after which the element is cooled and subsequently has the more resilient substance applied to it by longitudinal movement past a spray source of the heated substance.

12. A method according to claim 11 in which the element is extruded with a predetermined surface deficiency which is subsequently eliminated by the more resilient substance.

13. A method of making the flexible thermoplastics element carrying the more resilient thermoplastics substance, of the flexible fastener according to claim 5, in which a thermoplastics substance for the element and the more resilient thermoplastics substance are heated and are then simultaneously extruded through a common die producing the element together with either the rib or the groove or both and, integral with the element, the more resilient substance.

14. A method of making a flexible fastener according to claim 1 substantially as described with reference to and as illustrated in Figures 6 and 7, or 8, or 9 of the accompanying drawings.

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Printed for Her Majesty's Stationery Office by the Courier Press, Leamington Spa, 1969
Published by the Patent Office, 25 Southampton Buildings, London, W.C.2, from which copies may be obtained.

1145325 COMPLETE SPECIFICATION

3 SHEETS *This drawing is a reproduction of the Original on a reduced scale*

Sheet 1

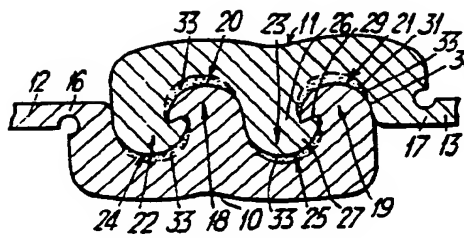


Fig.1.

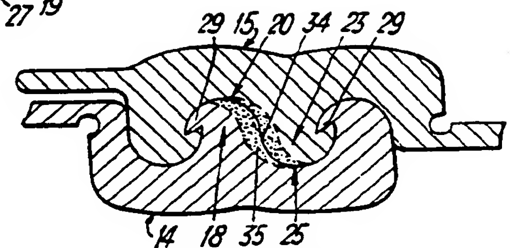


Fig. 2.

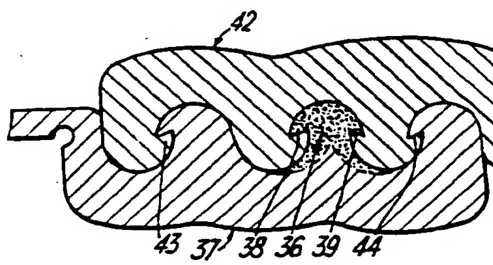


Fig.3.

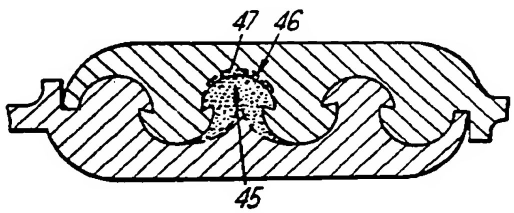


Fig.4.

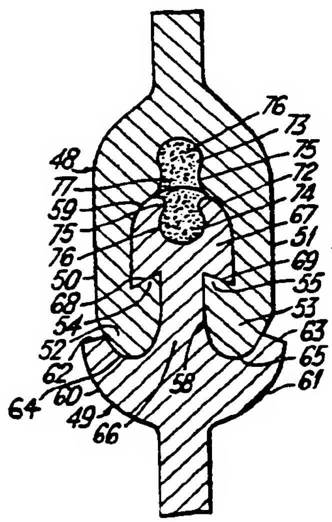
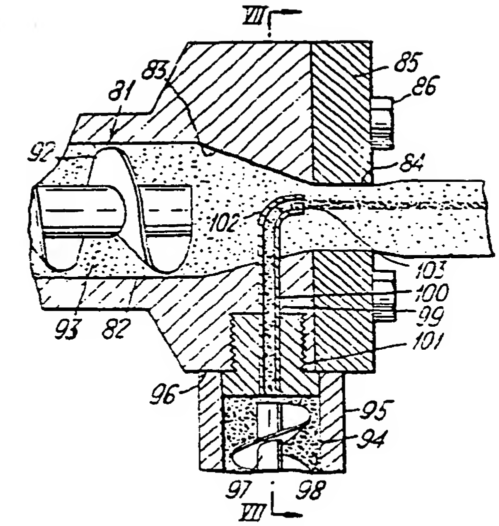


Fig.5.


VII
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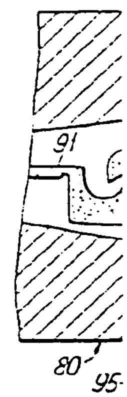
VII

Fig. 6.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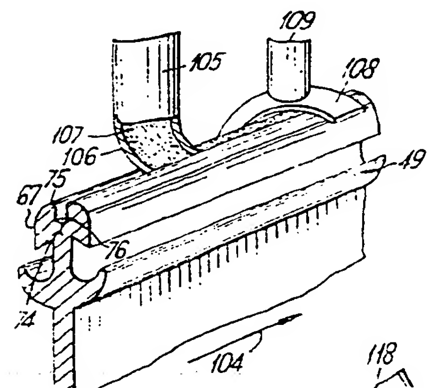
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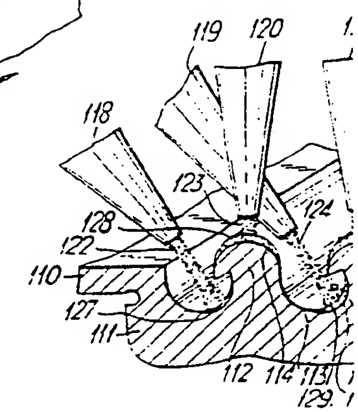
Fig. 8.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1145325 COMPLETE SPECIFICATION

3 SHEETS *This drawing is a reproduction of the Original on a reduced scale*

Sheets 2 & 3

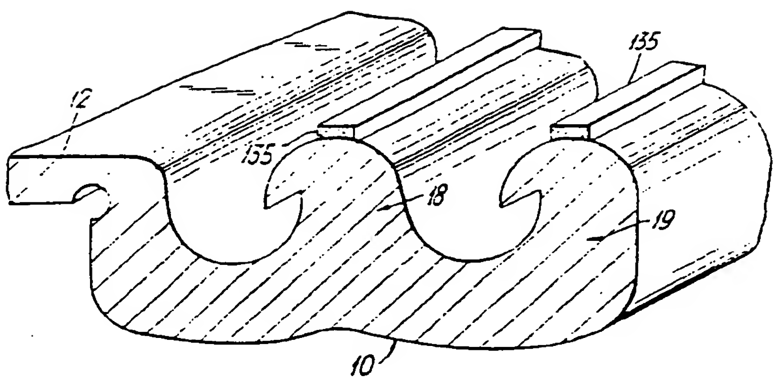


Fig. 10.

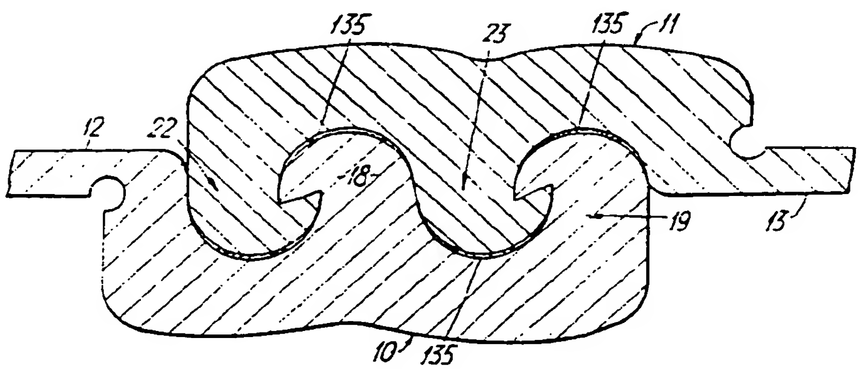


Fig. 11.

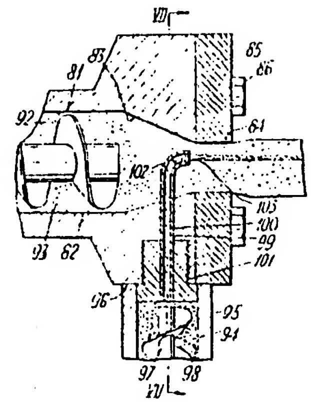


Fig. 6.

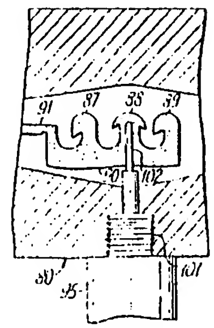


Fig. 7.

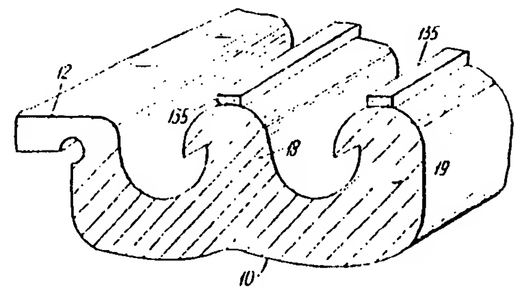
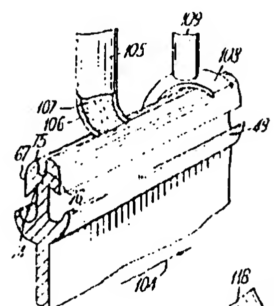


Fig. 10.



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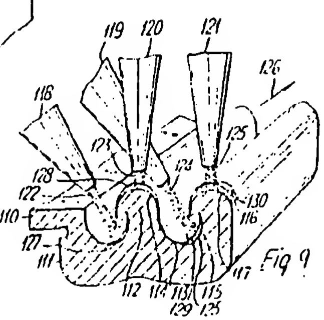

Fig 9

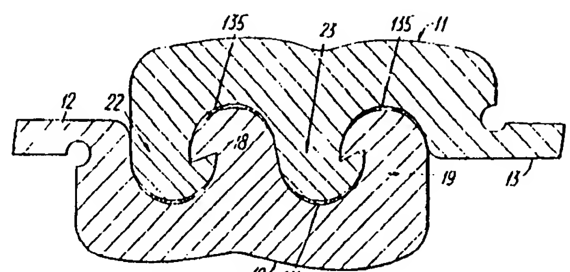

Fig. 11.